

CLAIMS

1. Ready-to-use composition for the oxidation dyeing of keratin fibres, and in particular human keratin fibres such as the hair, characterized in 5 that it comprises, in a medium which is suitable for dyeing:

- at least one first oxidation base chosen from para-phenylenediamine derivatives other than para-phenylenediamine, double bases, ortho-aminophenols and 10 heterocyclic bases,
- at least one second oxidation base chosen from para-aminophenols,
- at least one meta-aminophenol as coupler,
- at least one enzyme of 2-electron oxidoreductase 15 type, and
- at least one donor for the said enzyme.

2. Composition according to Claim 1, characterized in that the 2-electron oxidoreductase is chosen from pyranose oxidases, glucose oxidases, 20 glycerol oxidases, lactate oxidases, pyruvate oxidases and uricases.

3. Composition according to Claim 1 or 2, characterized in that the 2-electron oxidoreductase is chosen from uricases of animal, microbiological or 25 biotechnological origin.

4. Composition according to any one of the preceding claims, characterized in that the 2-electron oxidoreductase(s) represent(s) from 0.01 to 20% by

weight relative to the total weight of the ready-to-use dye composition.

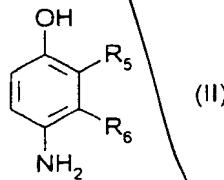
5. Composition according to Claim 4, characterized in that the 2-electron oxidoreductase(s) represent(s) from 0.1 to 5% by weight relative to the total weight of the ready-to-use dye composition.

6. Composition according to Claim 3, characterized in that the donor (or substrate) for the said 2-electron oxidoreductase is chosen from uric acid and its salts.

7. Composition according to any one of the preceding claims, characterized in that the donor(s) represent(s) from 0.01 to 20% by weight relative to the total weight of the ready-to-use dye composition.

15 8. Composition according to Claim 7, characterized in that the donor(s) represent(s) from 0.1 to 5% by weight relative to the total weight of the ready-to-use dye composition.

9. Composition according to any one of the preceding claims, characterized in that the para-aminophenols are chosen from the compounds corresponding to formula (II) below, and the addition salts thereof with an acid:



in which:

- R_5 represents a hydrogen or halogen atom or a C_1 - C_4 alkyl, C_1 - C_4 monohydroxyalkyl, $(C_1$ - $C_4)$ alkoxy(C_1 - C_4) alkyl, C_1 - C_4 aminoalkyl or hydroxy(C_1 - C_4) alkylamino(C_1 - C_4) alkyl radical,
- 5 - R_6 represents a hydrogen or halogen atom or a C_1 - C_4 alkyl, C_1 - C_4 monohydroxyalkyl, C_2 - C_4 polyhydroxyalkyl, C_1 - C_4 aminoalkyl, cyano(C_1 - C_4) alkyl or $(C_1$ - $C_4)$ alkoxy(C_1 - C_4) alkyl radical, it being understood that at least one of the radicals R_5 or R_6 represents a hydrogen atom.

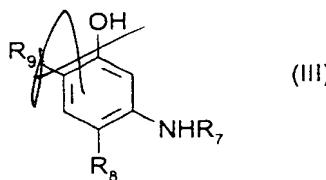
10. Composition according to Claim 9, characterized in that the para-aminophenols of formula (II) are chosen from para-aminophenol, 4-amino-3-methylphenol, 4-amino-3-fluorophenol, 4-amino-3-hydroxymethylphenol, 4-amino-2-methylphenol, 4-amino-2-hydroxymethylphenol, 4-amino-2-methoxymethylphenol, 4-amino-2-aminomethylphenol, 4-amino-2-(β -hydroxyethylaminomethyl)phenol and 4-amino-2-fluorophenol, and the addition salts thereof with an acid.

15. Composition according to any one of the preceding claims, characterized in that the para-aminophenol(s) represent(s) from 0.0005 to 12% by weight relative to the total weight of the ready-to-use dye composition.

20. Composition according to Claim 11, characterized in that the para-aminophenol(s) represent(s) from 0.005 to 6% by weight relative to the

total weight of the ready-to-use dye composition.

13. Composition according to any one of the preceding claims, characterized in that the meta-aminophenols are chosen from the compounds of formula 5 (III) below, and the addition salts thereof with an acid:



in which:

- R₇ represents a hydrogen atom or a C₁-C₄ alkyl, C₁-C₄ monohydroxyalkyl or C₂-C₄ polyhydroxyalkyl radical,
- R₈ represents a hydrogen atom, a C₁-C₄ alkyl or C₁-C₄ alkoxy radical or a halogen atom chosen from chlorine, bromine and fluorine,
- R₉ represents a hydrogen atom or a C₁-C₄ alkyl, C₁-C₄ alkoxy, C₁-C₄ monohydroxyalkyl, C₂-C₄ polyhydroxyalkyl, C₁-C₄ monohydroxyalkoxy or C₂-C₄ polyhydroxyalkoxy radical.

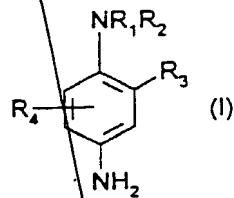
14. Composition according to Claim 13, characterized in that the meta-aminophenols of formula 20 (III) are chosen from meta-aminophenol, 5-amino-2-methoxyphenol, 5-amino-3-(β -hydroxyethoxy)phenol, 5-amino-2-methylphenol, 5-N-(β -hydroxyethyl)amino-2-methylphenol, 5-N-(β -hydroxyethyl)amino-4-methoxy-2-methylphenol, 5-amino-4-methoxy-2-methylphenol, 5-

amino-4-chloro-2-methylphenol, 5-amino-2,4-dimethoxyphenol and 5-(γ -hydroxypropylamino)-2-methylphenol and the addition salts thereof with an acid.

5 15. Composition according to any one of the preceding claims, characterised in that the meta-aminophenol(s) represent(s) from 0.0001 to 8% by weight relative to the total weight of the ready-to-use dye composition.

10 16. Composition according to Claim 15, characterized in that the meta-aminophenol(s) represent(s) from 0.005 to 5% by weight relative to the total weight of the dye composition.

15 17. Composition according to any one of the preceding claims, characterized in that the para-phenylenediamine derivatives are chosen from the compounds of formula (I) below, and the addition salts thereof with an acid:



in which:

20 - R₁ represents a hydrogen atom, a C₁-C₄ alkyl radical, a C₁-C₄ monohydroxyalkyl radical, a C₂-C₄ polyhydroxy-alkyl radical, a (C₁-C₄)alkoxy(C₁-C₄)alkyl radical, a C₁-C₄ alkyl radical substituted with a nitrogenous

group, a phenyl radical or a 4'-aminophenyl radical;

- R₂ represents a hydrogen atom, a C₁-C₄ alkyl radical, a C₁-C₄ monohydroxyalkyl radical, a C₂-C₄ polyhydroxy-alkyl radical, a (C₁-C₄)alkoxy(C₁-C₄)alkyl radical or a C₁-C₄ alkyl radical substituted with a nitrogenous group;

- R₃ represents a hydrogen atom, a halogen atom such as a chlorine, bromine, iodine or fluorine atom, a C₁-C₄ alkyl radical, a C₁-C₄ monohydroxyalkyl radical, a C₁-C₄ hydroxyalkoxy radical, an acetylamino(C₁-C₄)-alkoxy radical, a C₁-C₄ mesylaminoalkoxy radical or a carbamoylamino(C₁-C₄)alkoxy radical;

- R₄ represents a hydrogen or halogen atom or a C₁-C₄ alkyl radical;

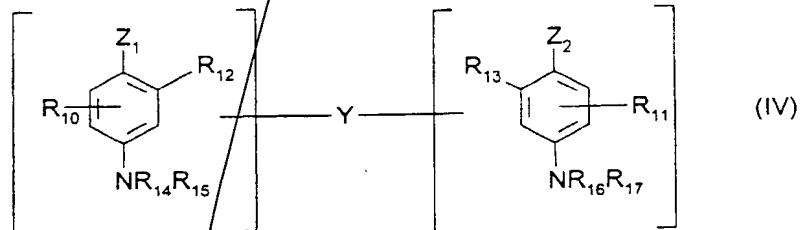
it being understood that at least one of the radicals R₁ to R₄ is other than a hydrogen atom.

18. Composition according to Claim 17, characterized in that the para-phenylenediamine derivatives of formula (I) are chosen from para-toluylenediamine, 2-chloro-para-phenylenediamine, 2,3-dimethyl-para-phenylenediamine, 2,6-dimethyl-para-phenylenediamine, 2,6-diethyl-para-phenylenediamine, 2,5-dimethyl-para-phenylenediamine, N,N-dimethyl-para-phenylenediamine, N,N-diethyl-para-phenylenediamine, N,N-dipropyl-para-phenylenediamine, 4-amino-N,N-diethyl-3-methylaniline, N,N-bis(β-hydroxyethyl)-para-phenylenediamine, 4-amino-N,N-bis(β-hydroxyethyl)-2-methylaniline, 4-amino-2-chloro-N,N-bis(β-hydroxy-

ethyl)aniline, 2- β -hydroxyethyl-para-phenylenediamine, 2-fluoro-para-phenylenediamine, 2-isopropyl-para-phenylenediamine, N-(β -hydroxypropyl)-para-phenylene-diamine, 2-hydroxymethyl-para-phenylenediamine,

5 N,N-dimethyl-3-methyl-para-phenylenediamine, N,N-(ethyl- β -hydroxyethyl)-para-phenylenediamine, N-(β , γ -dihydroxypropyl)-para-phenylenediamine, N-(4'-aminophenyl)-para-phenylenediamine, N-phenyl-para-phenylenediamine, 2- β -hydroxyethoxy-para-phenylenediamine, 2- β -acetylaminooethoxy-para-phenylenediamine and N-(β -methoxyethyl)-para-phenylenediamine, and the addition salts thereof with an acid.

19. Composition according to any one of the preceding claims, characterized in that the double bases are chosen from the compounds of formula (IV) below, and the addition salts thereof with an acid:



in which:

- Z₁ and Z₂, which may be identical or different, 20 represent a hydroxyl or -NH₂ radical which may be substituted with a C₁-C₄ alkyl radical or with a linker arm Y;

- the linker arm Y represents a linear or branched

alkylene chain containing from 1 to 14 carbon atoms, which may be interrupted by or terminated with one or more nitrogenous groups and/or one or more hetero atoms such as oxygen, sulphur or nitrogen atoms, and

5 optionally substituted with one or more hydroxyl or C_1 - C_6 alkoxy radicals;

10 R_{10} and R_{11} represent a hydrogen or halogen atom, a C_1 - C_4 alkyl radical, a C_1 - C_4 monohydroxyalkyl radical, a C_2 - C_4 polyhydroxyalkyl radical, a C_1 - C_4 aminoalkyl radical or a linker arm Y;

15 - R_{12} , R_{13} , R_{14} , R_{15} , R_{16} and R_{17} , which may be identical or different, represent a hydrogen atom, a linker arm Y or a C_1 - C_4 alkyl radical;

it being understood that the compounds of formula (IV) contain only one linker arm Y per molecule.

20. Composition according to Claim 19, characterized in that the double bases of formula (IV) are chosen from N,N' -bis(β -hydroxyethyl)- N,N' -bis(4'-aminophenyl)-1,3-diaminopropanol, N,N' -bis(β -hydroxyethyl)- N,N' -bis(4'-aminophenyl)ethylenediamine, N,N' -bis(4-aminophenyl)tetramethylenediamine, N,N' -bis(β -hydroxyethyl)- N,N' -bis(4-aminophenyl)-tetramethylenediamine, N,N' -bis(4-methylaminophenyl)-tetramethylenediamine, N,N' -bis(ethyl)- N,N' -bis(4'-amino-3'-methylphenyl)ethylenediamine and 1,8-bis(2,5-diaminophenoxy)-3,5-dioxaoctane, and the addition salts thereof with an acid.

21. Composition according to any one of the

preceding claims, characterized in that the ortho-aminophenols are chosen from 2-aminophenol, 2-amino-5-methylphenol, 2-amino-6-methylphenol and 5-acetamido-2-aminophenol, and the addition salts thereof with an acid.

22. Composition according to any one of the preceding claims, characterized in that the heterocyclic bases are chosen from pyridine derivatives, pyrimidine derivatives, pyrazole derivatives and pyrazolopyrimidine derivatives, and the addition salts thereof with an acid.

23. Composition according to any one of the preceding claims, characterized in that the para-phenylenediamine derivative(s) and/or the double base(s) and/or the ortho-aminophenol(s) and/or the heterocyclic base(s) represent(s) from 0.0005 to 12% by weight relative to the total weight of the ready-to-use dye composition.

24. Composition according to Claim 23, characterized in that the para-phenylenediamine derivative(s) and/or the double base(s) and/or the ortho-aminophenol(s) and/or the heterocyclic base(s) represent(s) from 0.005 to 6% by weight relative to the total weight of the ready-to-use dye composition.

25. Composition according to any one of the preceding claims, characterized in that the addition salts with an acid are chosen from the hydrochlorides, hydrobromides, sulphates, tartrates, lactates and

acetates.

26. Composition according to any one of the preceding claims, characterized in that the medium which is suitable for dyeing consists of water or a 5 mixture of water and at least one organic solvent.

27. Composition according to any one of the preceding claims, characterized in that it has a pH of between 5 and 11. *A*

28. Composition according to any one of the 10 preceding claims, characterized in that it contains at least one peroxidase.

29. Process for dyeing keratin fibres, and in particular human keratin fibres such as the hair, characterized in that at least one ready-to-use dye 15 composition as defined in any one of the preceding claims is applied to the said fibres, for a period which is sufficient to develop the desired coloration.

30. Process according to Claim 29, characterized in that it includes a preliminary step 20 which consists in separately storing, on the one hand, a composition (A) comprising, in a medium which is suitable for dyeing, at least one first oxidation base chosen from para-phenylenediamine derivatives, double bases, ortho-aminophenols and heterocyclic bases, at 25 least one second oxidation base chosen from para-aminophenols, at least one meta-aminophenol as coupler, and, on the other hand, a composition (B) comprising, in a medium which is suitable for dyeing, at least one

enzyme of 2-electron oxidoreductase type in the presence of at least one donor for the said enzyme, and then in mixing them together at the time of use, after which this mixture is applied to the keratin fibres.

- 5 31. Multi-compartment dyeing device or "kit", characterized in that it includes a first compartment comprising composition (A) as defined in Claim 30 and a second compartment comprising composition (B) as defined in Claim 30.

RECORDED IN THE U.S. PATENT AND TRADEMARK OFFICE

App C3
App D2